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70. *Grimmia apocarpa* (L.) Hedw. Dry or moist rocks. Hulett's Lg. (Levy); Shushan (Dobbin); road near Wiggins iron mine, W. Fort Ann and vicinity of Vaughns, determined by Mr. Kaiser. The sterile Luzerne plants (G. W. Clinton) known as *Schistidium Agassizii* Sull. & Lesq., reported in N. Y. State Cab. Rep. 20: 405. 1867, were compared by Dr. Peck, June 23, 1902, with specimens of *S. Agassizii* from Lake Superior in the Sullivant and Lesquereux exsiccati. Dr. Peck says, "while it approaches that species closely in its small size and costa ceasing below the apex of the leaves, I conclude from the shape of the leaves that it is rather a form of *S. apocarpum*."

(To be Continued)

HINTS FOR LICHEN STUDIES

ALBERT C. HERRE

There are apparently very few people in this country actively engaged in the study of lichens. Just why this should be so is rather difficult to see, since many lichens are quite conspicuous, either from their size, color, or numbers. Perhaps the greatest obstacle has been the difficulty experienced by the isolated amateur in finding out their names, whereas the numerous manuals of flowering plants readily afford one an easy introduction to the higher plants.

In this country we have perhaps neglected most the study of the physiological activities of lichens. We know relatively little concerning the rate of growth of these organisms, and the causes which may make a given species grow to a much greater size in one region than it does in another. My personal belief, based upon observations of lichens over the region lying between Canada and Mexico, Great Salt Lake and the Pacific, is that actual amount of rainfall is only a minor factor, since *Ramalina reticulata*, easily the largest of North American lichens, reaches its maximum growth with a rainfall of but 16 to 20 inches. A greatly prolonged growing season, high atmospheric humidity but not necessarily much rainfall, and an undisturbed substratum, are probably the three most important growth conditions for lichens. It is such conditions which make possible the almost incredible length which the fibers of *Usnea longissima* attain in the mountains of Java, and the coast range of Oregon.

There is room for a thousand enthusiastic nature lovers scattered over the country to take observations for a series of years upon the increase in diameter of the thallus of our common bark- and rock-dwelling lichens. The exposure upon which growth first appears and is most rapid, the growth in sun and shade, as affected by prevailing winds, or other evident variable conditions, are all things which could be profitably recorded, and after sufficient material had been obtained the results should be collated and published.

The way in which heredity is transmitted in lichens is a field which should be investigated. As suggested by me on other occasions, Mendelian inheritance as exemplified in most organisms is an impossibility. Under the means by which lichens are usually propagated no sexual reproduction with its complex of chromosome division is involved. Lichens are in general asexually reproduced, but

they have a real and positive heredity even tho they are not species in the ordinary sense of the word. A lichen is a physiological species and not a species in the same sense as are *Linnaea americana*, *Cocos nucifera*, or *Agaricus campestris*. I have elsewhere suggested what I believe to be the controlling factors of lichen heredity and the development of new species of lichens. But the whole matter needs patient and prolonged investigation and would well repay the efforts of some students of genetics.

If a few members of the Sullivant Moss Society will take the trouble to record at stated intervals such data as readily lend themselves to exact measurement or definite experiment, they will be making a real contribution to our knowledge of these unique organisms.

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DR. CORREN'S INVESTIGATIONS AND STERILE MOSSES

JOHN M. HOLZINGER

In the fourth volume of *THE BRYOLOGIST*, January, 1901, the writer announced the discovery in Minnesota of *Webera prolifera*, a moss which in the fall of each year develops great numbers of gemmae, or bulbils, in the leaf-axils of the sterile plants. Since that time Dr. Corren's able work, *Investigations into Propagation of Mosses by Gemmae and Budding*,¹ has come to hand. With great diligence and care this author investigates 915 species. It is not generally known as it deserves to be, especially by the younger moss students, that the result of these studies has more than a passing importance for systematic investigations. Dr. Correns has a chapter on the Use of Bulbils and Gemmae in Systematic Determinations (of sterile plants), which finds a happy illustration in two recent determinations; the one actually accomplished, the other verified, by the use of this book.

I had collected last summer a small, beautiful green, sterile moss, which puzzled and troubled me for quite a while. The curly leaves broke off with the greatest ease. A leaf section showed median guides. The slender leaf-points were papillose. Interspersed with the delicate plants were alga-like threads, larger than the protonema threads of *Ephemerum*. These, I have since learned, are Dr. Corren's "chloronema," formed from the protonema. The patches of this moss occurred on the bark at the bases of trees, usually birches. They frequently covered areas the size of two hands. Small patches interspersed, which looked like beautiful green velvet, on examination proved to be areas where the chloronema had completely displaced the leafy plants. These observations persuaded me that I had before me a small, sterile, *Dicranum*. On

¹Untersuchungen ueber die Vermehrung der Laubmoose durch Brutorgane und Steckinge. von Dr. Carl Correns, Jena, 1899. pp. 1-472 + i-xxiv.